

CLAIM AMENDMENTS

1. (Currently Amended) ~~The apparatus aspect of this invention provides a guidance A guidance system for the boring head of a micro-tunnelling machine of the type which bores in a selected direction and inclination using laser beam guidance having the endmost part of the drive to the boring bit adjustable relative to the boring head in two directions at 90° wherein, the endmost part of the drive has a target for the laser beam, means to convey an image of the target and the laser strike position thereon to an operator situated remotely from the boring head and input means for the operator to adjust the direction of the endmost part of the drive.~~

2. (Original) A guidance system as claimed in Claim 1, wherein the means to convey the image is a video camera.

3. (Currently Amended) A guidance system ~~s-claimed as claimed in~~ in Claim 2, wherein the target is a surface against which the laser is visible in contrast.

4. (Original) A guidance system as claimed in Claim 3, wherein the target has markings to help the operator to centre the direction of the boring bit.

5. (Original) A guidance system as claimed in Claim 1, wherein the input means for the operator comprises switches for controlling adjusters which act on the drive shaft.

6. (Original) A guidance system as claimed in Claim 5, wherein the switches are grouped for joystick operation.

7. (Original) A guidance system as claimed in Claim 5, wherein the adjusters are a pair of rams mutually disposed at an angle and connectable to a source of water pressure and to a water drain.

8. (Currently Amended) A guidance system as claimed in Claim 7, wherein ~~the ram each ram~~ has a water in port and a water out port and ram movement is initiated by connection of the out port to drain.

9. (Cancelled)

10. (Original) A guidance system as claimed in Claim 1, wherein the boring head is 200-800mm in diameter.

11. (Original) A guidance system as claimed in Claim 1, wherein the bore rate is 9-95 ft/hr.

12. (Original) A guidance system as claimed in Claim 5, wherein the input means includes input signals from an imaging system which uses the camera image to compare the bore direction indicated by the target with the laser beam direction and operates switches until the operator assumes manual control.

13. (New) A system for laser-beam guidance of a microtunnelling machine comprising:

a boring head having a forward wall formed with an aperture,  
a boring bit forward of the forward wall of the boring head and rotatable relative to the boring head,

a drive shaft coupled at a forward end thereof to the boring bit and extending rearward from the boring head through the forward wall of the boring head and a rearward end of the boring head, the aperture in the forward wall of the boring head permitting adjustment of the drive shaft relative to the boring head in two directions that are substantially perpendicular to each other and to a longitudinal axis of the boring head,

a target for the laser beam attached to the drive shaft,  
a means for acquiring an image of the target and the laser strike position thereon and for conveying the image to an operator situated remotely from the boring head, and

an input means for the operator to adjust the direction of the forward end of the drive shaft.

14. (New) A microtunnelling machine comprising:

a boring head having a forward end and a rearward end,  
a boring bit at the forward end of the boring head and rotatable relative to the boring head, the boring bit being adjustable relative to the boring head in two directions that are substantially

perpendicular to each other and to a longitudinal axis of the boring head,

a drive motor located to the rear of the boring head,

a drive shaft coupled at a forward end thereof to the boring bit and extending from the boring head through the rearward end of the boring head, the drive shaft being coupled at a rearward end to the drive motor for driving the boring bit to rotate relative to the boring head,

a target for a laser beam attached to the drive shaft at the forward end of the drive shaft,

a means for acquiring an image of the target and the laser strike position thereon and for conveying the image to an operator situated remotely from the boring head, and

an input means for the operator to adjust the direction of the forward end of the drive shaft.

15. (New) A microtunnelling machine according to claim 14, comprising an operator station located to the rear of the boring head, and wherein the drive motor is located at the operator station, the operator station includes said input means and a laser source for emitting said laser beam.

16. (New) A microtunnelling machine according to claim 14, wherein the drive shaft is hollow and the machine comprises a liquid supply means for supplying water to the boring bit through the drive shaft, and the drive shaft is formed with outlet apertures for discharging water at a forward face of the boring bit.